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Economic Value of Ractopamine (Paylean™) for Finishing Pigs

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Summary and Implications

Ractopamine, a feed additive which improves feed efficiency, daily gain and several carcass characteristics recently became available to pork producers. An economic feasibility analysis on the feeding of 4.5, 9.0, and 18.0 g/ton ractopamine to finishing pigs fed a 16% crude protein (0.82% lysine) corn-soybean meal diet from 150 to 240 lb was conducted. The analysis was performed in two stages: 1) an economic benefit for ractopamine was calculated from cost savings due to improved feed efficiency and daily gain, and 2) the amount of carcass premium needed per pig to recover the added cost of feeding ractopamine was calculated for each dietary level of ractopamine. We assumed one pound of Paylean™, containing 9 grams of ractopamine per pound, cost $26. As expected, the economic benefit (considering improved feed efficiency and daily gain) of feeding ractopamine increases as corn and soybean meal prices increase. However, its use cannot be justified economically through improved feed efficiency and daily gain alone (corn =$2.00/bu; soybean meal = $200/ton). A producer would need to earn carcass premiums averaging $.41, $1.85, or $4.97 per pig in order to recover the cost of feeding 4.5, 9.0, and 18.0 g/ton ractopamine, respectively. From the standpoint of costs and returns and assuming carcass premium is based on 10th rib backfat, it appears easier to justify feeding 9 g/ton ractopamine compared to 4.5 or 18 g/ton, because the first 9 grams of ractopamine resulted in the biggest reduction in 10th rib backfat (.09 inches), while an additional 9 g/ton (total of 18 g/ton) reduced backfat another .04 inches only. However, if carcass premium is based on a measure of loin eye area, feeding 4.5 g/ton ractopamine may be the best choice. We conclude that a consistent carcass premium is necessary to justify feeding ractopamine economically and that producers supplement published research information on responses to feeding ractopamine with data generated on their own pigs.

Introduction

Pork producers have the opportunity to use a new feed additive, ractopamine, in finishing pig diets. Ractopamine (Paylean™; Elanco Animal Health) belongs to a class of compounds know as beta-agonists. These compounds are similar in structure and pharmacological properties to epinephrine (adrenaline), a hormone secreted by the adrenal gland. Beta-agonists alter how nutrients that pigs

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consume are used for growth; more nutrients are used for muscle deposition and less are used for fat synthesis. Ractopamine was recently approved by the Food & Drug Administration (FDA) for increased rate of gain, improved feed efficiency, and increased carcass leanness in finishing pigs fed a complete diet containing at least 16% crude protein from 150 to 240 lb. The additive can be included in a finisher diet at 4.5, 9.0, or 18.0 g/ton.

As new technologies become available, it is important that producers carefully evaluate their value. In this paper we intend to provide producers a tool to estimate the economic feasibility of feeding ractopamine to finishing pigs. Experience feeding ractopamine under current conditions in the pork industry is very limited, thus this is a progress report.

Performance Results

A summary of several studies conducted to determine the effect of feeding ractopamine to finishing pigs is shown in Tables 1 and 2. Daily gain and feed efficiency increased by 7 and 8%, respectively, when pigs were fed diets containing 4.5 g/ton ractopamine (Table 1). Further additions of ractopamine only slightly improved gain and efficiency. Adding 14.5 g/ton more ractopamine (total of 18.0 g/ton) improved daily gain and feed efficiency by 3 and 5%, respectively, over the 4.5 g/ton response. Thus, the total response observed from 18.0 g/ton of ractopamine for daily gain and feed efficiency was 10 and 13%, respectively. Adding 4.5 g/ton of ractopamine also significantly reduced feed intake, but the overall response was much less than that observed for daily gain and feed efficiency.

The effect ractopamine had on carcass characteristics varied depending on the trait measured (Table 2). Dressing percent was improved at all levels of ractopamine. Midline backfat at the last rib, average midline backfat, and 10th rib fat depth were not affected when 4.5 g/ton ractopamine was added to the diet. However, 10th rib backfat

Table 1. Effect of ractopamine on finisher pig growth performance[a].

	Ractopamine, g/ton			
Item	0	4.5	9.0	18.0
No. of pens	84	84	84	82
No. of pigs	479	488	486	469
Daily gain, lb	1.84	1.97[b]	1.99[b]	2.02[b]
Daily feed, lb	6.60	6.50[c]	6.42[b]	6.34[b]
Feed/gain	3.62	3.33[b]	3.25[b]	3.16[b]

[a]Adapted from Elanco Paylean™ Technical Summary. Average beginning and final body weights were 150 and 240 lb, respectively. A 20-trial summary. Dietary protein and lysine = 16 and .82%, respectively.
[b]Different from the control diet (P < .01).
[c]Different from the control diet (P < .05).

Table 2. Effect of ractopamine on finisher pig carcass measurements[a].

	Ractopamine, g/ton			
Item	0	4.5	9.0	18.0
Slaughter weight, lb	232	233	233	232
Dressing percent	73.3	73.7[b]	74.1[c]	74.4[c]
Midline last rib backfat, in	.99	1.00	.98	.97
Avg midline backfat, in	1.21	1.23	1.19	1.17[b]
10th rib fat depth, in	1.08	1.06	.99[c]	.95[c]
10th rib loin eye area, in^2	5.08	5.51[c]	5.68[c]	5.80[c]

[a]Adapted from Elanco Paylean™ Technical Summary. Dietary protein and lysine = 16 and .82%, respectively.
[b]Different from the control diet (P < .05).
[c]Different from the control diet (P < .01).

Table 3. Benefit ($ per pig) from feeding 4.5 g/ton ractopamine at alternative corn and soybean meal prices[a].

	Corn, $/bushel			
44% CP soybean meal, $/ton	1.50	2.00	2.50	3.00
150	1.06	1.24	1.42	1.60
200	1.21	1.38	1.56	1.74
250	1.35	1.53	1.71	1.88
300	1.49	1.67	1.85	2.03

[a]Calculated from feed efficiency values in Table 1.

Table 4. Benefit ($ per pig) from feeding 9.0 g/ton ractopamine at alternative corn and soybean meal prices[a].

	Corn, $/bushel			
44% CP soybean meal, $/ton	1.50	2.00	2.50	3.00
150	1.36	1.58	1.81	2.04
200	1.54	1.77	1.99	2.22
250	1.72	1.95	2.18	2.41
300	1.91	2.13	2.36	2.59

[a]Calculated from feed efficiency values in Table 1.

Table 5. Benefit ($ per pig) from feeding 18.0 g/ton ractopamine at alternative corn and soybean meal prices[a].

	Corn, $/bushel			
44% CP soybean meal, $/ton	1.50	2.00	2.50	3.00
150	1.69	1.97	2.26	2.54
200	1.92	2.20	2.48	2.77
250	2.15	2.43	2.71	3.00
300	2.37	2.66	2.94	3.22

[a]Calculated from feed efficiency values in Table 1.

depth was significantly reduced at the 9.0 g/ton inclusion rate and at 18.0 g/ton ractopamine seemed to reduce backfat slightly further. A significant reduction in average midline backfat was not observed until 18 g/ton ractopamine was included in the diet, while there was no change detected in last rib midline backfat. Ractopamine increased loin eye area, especially at the 4.5 g/ton level.

Estimated Value

To estimate the economic value of ractopamine in a finishing pig diet, four 16% crude protein (0.82% lysine), corn-soybean meal diets were formulated (This level of lysine is about 0.1% units higher than the 0.72% that we normally recommend for 150 to 240 lb finishing pigs that are not fed ractopamine. Because ractopamine reduces feed intake and increases lean gain, dietary amino acid level should be increased.). All the diets contained 44% crude protein soybean meal as the sole source of supplemental protein and the same level of energy, amino acids, vitamins and minerals. Diets were formulated to contain 0, 4.5, 9.0, and 18.0 g/ton of ractopamine. Ractopamine replaced corn in the diet.

Feed Efficiency

The responses for feed efficiency shown in Table 1 were applied to the diets containing ractopamine. The cost savings realized from improved feed conversion were attributed to ractopamine. (*Note* - The control diet for calculating the cost savings was a 16% protein (0.82% lysine) diet, not the typical 0.72% lysine diet recommended for pigs in this weight range.) The feed cost savings per pig is the benefit from feeding 4.5 (Table 3), 9.0 (Table 4), and 18.0 g/ton ractopamine (Table 5). This benefit is of course higher at higher corn and soybean meal prices.

Approximately two-thirds of the total benefit from increased feed efficiency is realized at the 4.5 gram per ton level. For example, at a corn price of $2.00/bu and soybean meal price of $200/ton, the benefit from using 4.5 grams/ton is $1.38 per pig, while the added benefit from using another 4.5 grams/ton (9 grams/ton) is only $0.39 per pig ($1.77-$1.38). The added benefit from feeding 18 grams/ton vs 9 grams/ton is $0.43 per pig ($2.20-1.77). The marginal benefits of feeding ractopamine from improvements in feed efficiency decrease at the 9 and 18 g/ton level, because of the diminishing response observed in feed efficiency as the dietary level of the additive increased (Table 1).

Average Daily Gain

This is a difficult benefit to quantify. Based on data in Table 1, pigs receiving diets containing 4.5, 9.0, and 18.0 g/ton of ractopamine would reach market weight 3.2, 3.7, and 4.3 days sooner than those not receiving ractopamine. These changes are not of a magnitude to justify changing the number of turns per year in a facility, but there could be other sources of benefit. For example, if all pigs were sold from a facility a few days early, some savings in interest, utilities and repairs might be realized. Or, the manager may choose to feed the pigs the "normal" time, and realize a benefit in extra pounds sold, less added feed cost. Still another source of benefit could be fewer lightweight pigs when the facility is completely emptied, resulting in less sort loss.

We chose the most conservative estimate, that of interest, utility and repair savings due to pigs going to market earlier. This was credited at the rate of $.05 per pig per day, resulting in benefits of $.16, $.18, and $.22 per pig for the 4.5, 9.0, and 18.0 g/ton of ractopamine.

Carcass Premiums

Given the current cost of ractopamine used in our budgeting process, its use cannot be justified economically by increased feed efficiency and average daily gain alone. However, ractopamine increases loin eye area and may reduce carcass backfat (Table 2). That could generate additional income for the producer. The question is whether current packer carcass merit buying programs fully reward the producer for the investment in ractopamine. To generate a carcass premium, the technology applied to the pig must change carcass merit enough to move its carcass into a better pricing category. The percentage of pigs in a group that would be shifted to a better pricing category would depend on the size of the range for the carcass trait(s) measured within each pricing category and how much the technology changes carcass merit.

Because of the large variation in genetics, production systems and differences in packer buying grids and how carcasses are evaluated, it is difficult to develop estimates of the benefit a producer would receive in carcass premiums. The approach we have taken is presented in Figure 1. The cost of ractopamine at each of the inclusion levels is represented by a bar in the graph. We assumed Paylean™, containing 9 grams of ractopamine per pound, cost $26 per pound. The benefits from increased feed efficiency and average daily gain are shown, as is the carcass premium that would be needed per pig in order to recover the added cost of feeding ractopamine. According to our calculations, a producer would need to earn carcass premiums averaging $.41, $1.85, and $4.97 per pig in order to recover the cost of feeding 4.5, 9.0, and 18.0 g/ton ractopamine, respectively. If a producer considers it highly likely to obtain a larger average premium than that shown in Figure 1, it would be profitable to feed ractopamine. When considering possible premiums for carcass merit, note that it is likely that not all carcasses from a group of pigs fed ractopamine will be shifted into a higher carcass pricing category and earn a premium. Thus, carcasses from pigs that earned a premium must pay for the ractopamine consumed by pigs that did not earn a carcass premium.

The price of Paylean™ also will affect the size of the carcass premium

needed per pig. For each $2/lb change in the price of Paylean™, the carcass premium required changes by approximately $.15, $.30, and $.60 per pig for the 4.5, 9.0, and 18.0 g/ton levels, respectively. For example, if Paylean™ cost $24/lb (we used $26 in our analysis), the carcass premium required to break even feeding 4.5, 9.0 and 18.0 g/ton ractopamine would be $.26, $1.55, and $4.37, respectively.

The carcass premium necessary to justify feeding 4.5 g/ton ractopamine is much lower than for the higher inclusion rates of the additive. However, according to the data in Table 2, 4.5 g/ton of ractopamine does not reduce backfat. Therefore, to justify feeding 4.5 g/ton ractopamine, all the benefit would need to come from improved feed efficiency and daily gain if the carcass merit program was based on backfat only. Corn or soybean meal prices would need to rise above $3/bu or $300/ton, respectively, for that to occur or the price of Paylean™ would need to be about $20/lb. If, however, the carcass premium is based on a measure of loin eye area, feeding 4.5 g/ton ractopamine may be easy to justify under our input price assumptions. Assuming pigs are evaluated on 10th rib backfat, the greater economic potential may be for feeding 9 g/ton ractopamine compared to 4.5 or 18 g/ton. The first 9 g of ractopamine resulted in the biggest reduction in 10th rib backfat (.09 inches); an additional 9 g/ton (total of 18 g/ton) reduced backfat another .04 inches only.

The cost of Paylean™ per pig may be understated in Figure 1. The costs shown reflect adding Paylean™ to an existing 16% protein (0.82% lysine) diet. Producers who are currently following UNL swine nutrient recommendations (available at http://ianrwww.unl.edu/pubs/swine/ec273.htm), feeding a 15% protein (0.72% lysine) diet, would incur a cost of $0.82 per pig ($2/bu corn and $200/ton soybean meal) to switch to the 16% protein diet, so that they could feed Paylean™. If no improvement in feed efficiency resulted from the switch to a 16% protein diet, the $0.82 would be an added cost per pig of feeding Paylean™, and the carcass premium required (Figure 1) from feeding the 9 g/ton level would be $2.67 instead of $1.85 per pig ($1.85+0.82). An decrease of 0.18 lb feed per pound of gain would be required to offset the cost of changing from a 15% to a 16% crude protein diet.

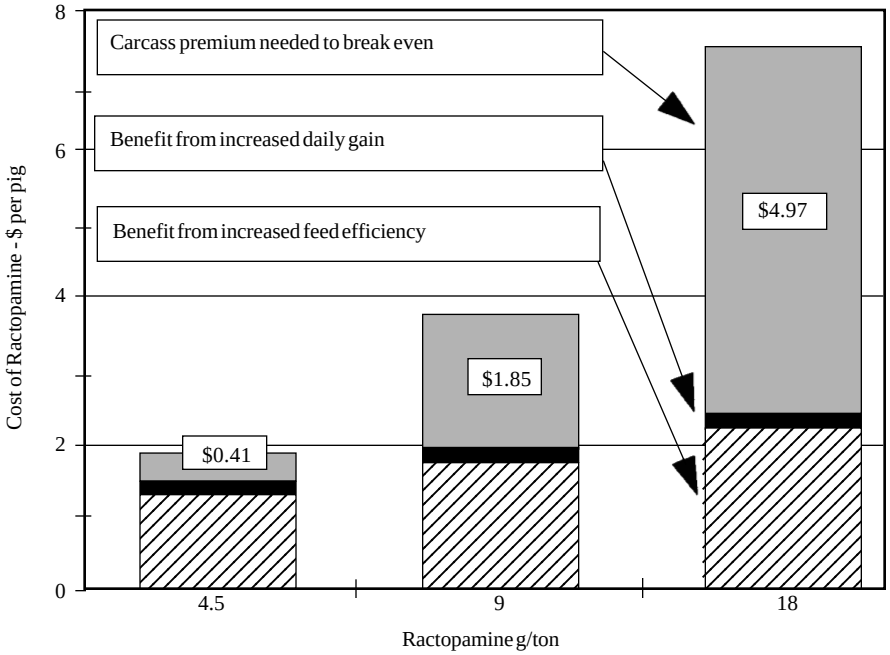

Figure 1. Estimated benefit from feeding 4.5, 9, or 18 g/ton ractopamine to finishing pigs (150 to 240 lb) considering improvements in feed efficiency and daily gain. The difference between the cost of ractopamine per pig and the benefits shown represents the amount of carcass premium required to cover the cost of ractopamine consumed. Selected ingredient prices: Paylean™, containing 9 grams ractopamine per lb, $26/lb; corn $2.00/bu; 44% soybean meal $200/ton.

Conclusion

Practical experience with feeding ractopamine in today's pork industry is limited. Therefore, it is important that producers calculate the costs and benefits of ractopamine for themselves and supplement that with published research data. Three key variables affecting the level of carcass merit premium required are the prices of Paylean™, corn and soybean meal.

It may be very useful for producers to collect data from their own pigs fed ractopamine. The data we used in this analysis (Table 1 and 2) was generated during the late 1980s and early 1990s. Improvements have been made in the genetic merit of pigs since then that could affect the response to ractopamine. In addition, further research may indicate that the response to ractopamine could be different when diets contain more than 16% crude protein or when ractopamine is fed for shorter lengths of time than over the 150 to 240 lb range that we modeled. Moreover, one would obtain specific information from the packer which would help decide if the carcass premiums we calculated are likely to be obtained. Guidelines for conducting on-farm feed research trials are available in the University of Nebraska publication, *Conducting Pig Feed Trials on the Farm (EC 92-270)* available at county extension offices in Nebraska or on the Internet at http://www.ianr.unl.edu/pubs/swine/ec270.htm.

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